MILL SECTION of
Concrete

TESTS, 1:3 STANDARD SAND

Days:	3	7	14	28	90	180	365
Tensile strength lbs. per sq. in.:	478	581	610	649	697	724	778
Compression lbs. per sq. in.:	5723	7739	8406	9386	10082	10721	12141

This Cement is made in Holderbank, Switzerland. The Plant was completely equipped by Polysius and is famous for its efficiency, economy and cleanliness. Wet process, Polysius crushers, Solo Kilns and Solo Mills have been in operation since 1912.

POLYSIUS CORPORATION
BETHLEHEM TRUST BUILDING
BETHLEHEM, PA.

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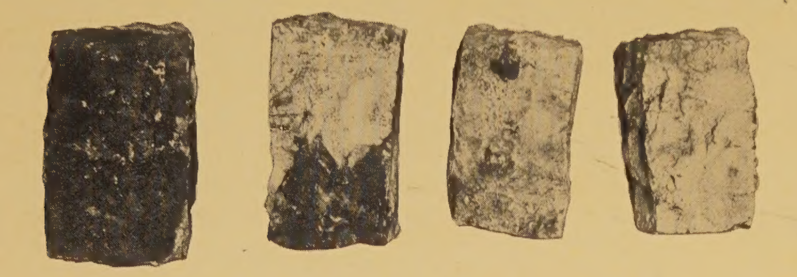
TUBEMILL LININGS

Silex



Silex is pure flint stone. It has been used for lining tubemills for many years. The rough hewn surface of the Silex gives a maximum friction between the lining and the charge in the tubemill resulting in the highest efficiency in the operation of the machine. The rough surface is retained by the Silex during its entire life in the tubemill.

The best Silex is quarried in Belgium. For more than thirty years we have been importing Belgian Silex, usually in three thicknesses, 2½-in., 3-in., and 4-in.

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Dragpeb

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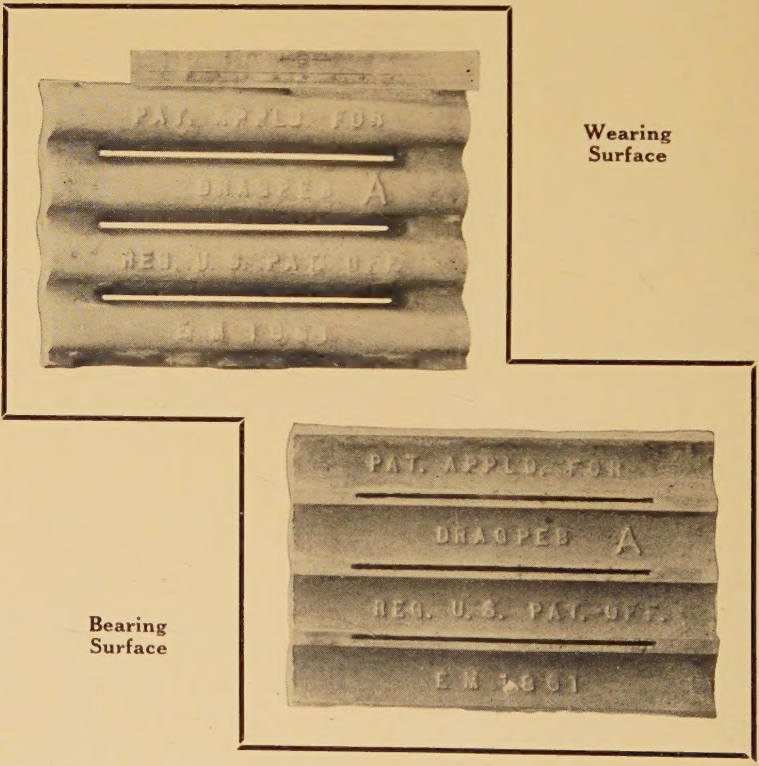
Dragpeb liners for tubemills are made of a special mixture of hard iron, under strict laboratory control. The Dragpeb lining has been developed to give the frictional effect of the Silex. Dragpeb liners will not become smooth or polished but will retain their original corrugations. Dragpeb liners have an efficiency equal to the Silex and will wear better.

No bolts or wedges are required for fastening Dragpeb liners in the tubemill. Portland cement is used.

Prices on application



Wearing Surface

Bearing Surface

F. L. Smidth & Co., Inc.

ENGINEERS

Designers and Equippers of Cement Making Factories

50 Church Street **New York City**

Factory, Foundry and Laboratory—Elizabeth, N. J.

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MILL SECTION of

Concrete

The Mill Edition of CONCRETE is edited for the manufacturers of portland cement, lime and similar products. Its pages are devoted to discussions of plant design, management, operation, production efficiency, chemical research and control, quarry operation, progress and news of the industry.

The Mill Edition also contains all the material published in the corresponding Regular Edition and so provides news of the uses and merchandising of the materials whose manufacture is discussed in the Mill Edition.

The Regular Section furnishes mill operating officials and mill executives valuable points of contact with the users of the materials they produce.

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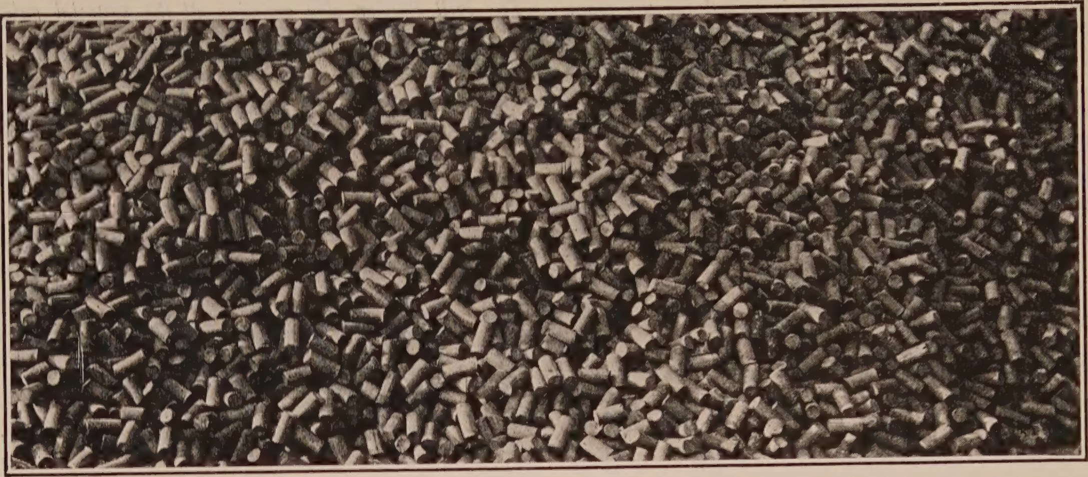
GRINDING MEDIA



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Forged under controlled conditions from high chromium and carbon steel. A hard and long wearing grinding body of moderate price and very satisfactory performance. A favorite in many mills.

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Write Us for Prices

Coates Steel Products Company
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Largest Exclusive Manufacturers of Grinding Media

MILL SECTION of

Concrete

Vol. 30 Chicago, June, 1927 No. 6

Old Acme Plant Completely Modernized

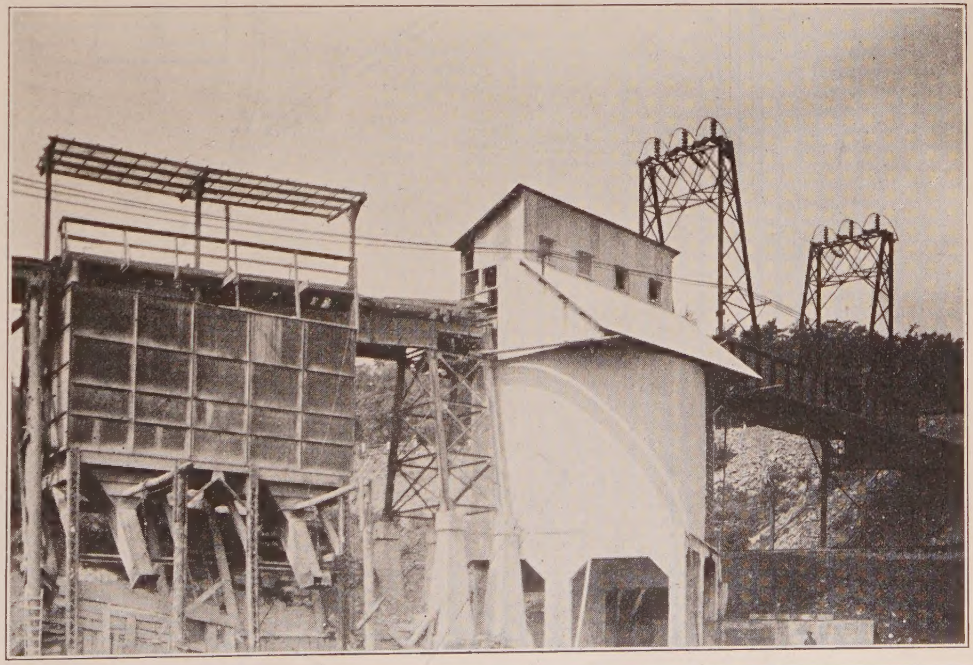
Work of Modernization of Old Acme Plant at Catskill, New York, Completed Under the Direction of Wm. H. Baker — Production Increased — Manufacturing Costs Reduced—An Unusually Important Rebuilding Project

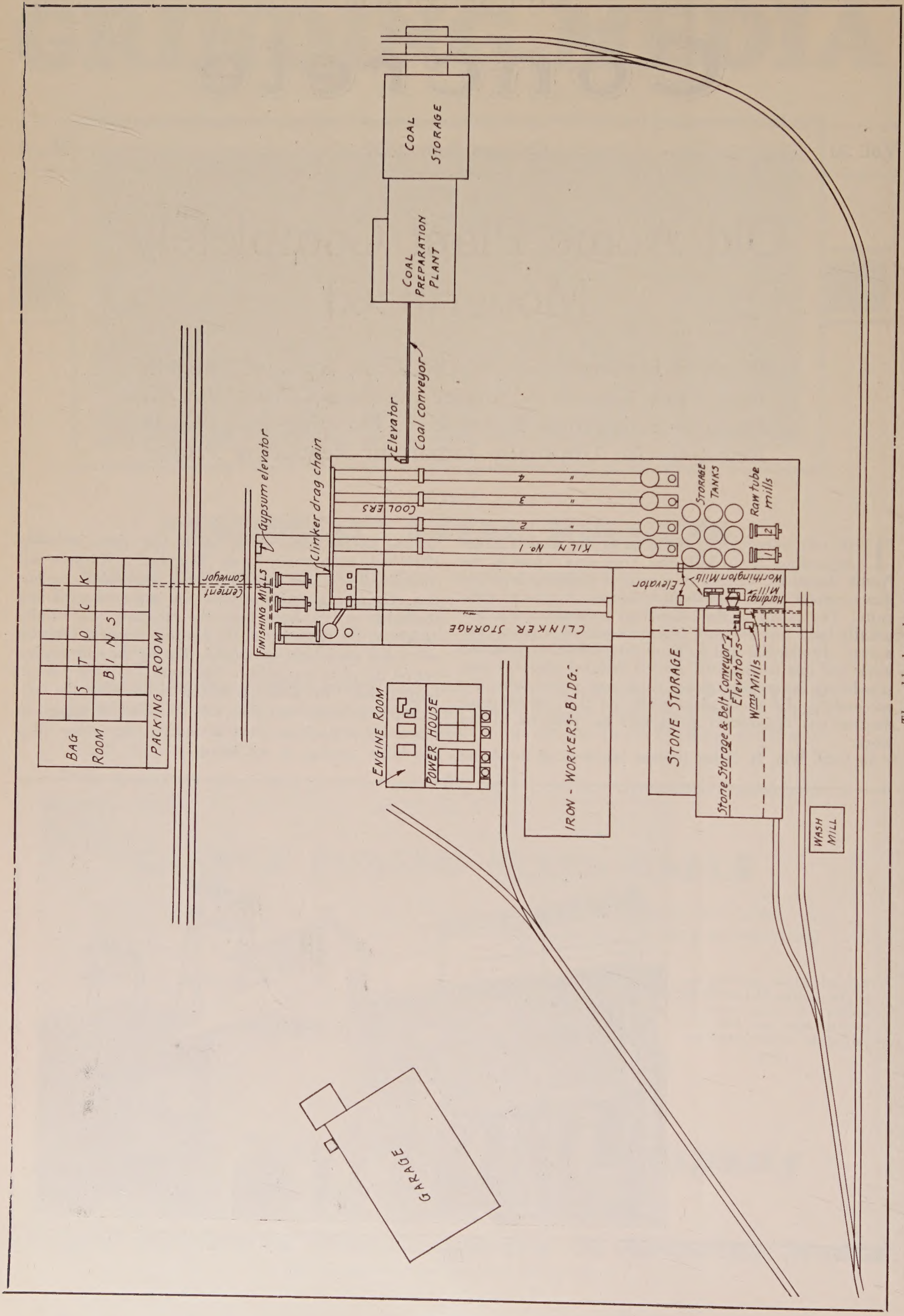
Part I

THE rebuilding of the old plant of the Acme Cement Corporation at Catskill, New York, now a part of the North American Cement Corporation system, involved many cement plant engineering features of unusual difficulty. The extent of the alterations undertaken was unusually large and the work covered a period of more than a year. Production had to be maintained throughout the work and this necessitated careful detailed planning and scheduling before the actual work was undertaken. So successfully did these plans work out that normal production was maintained throughout the progress of the work.

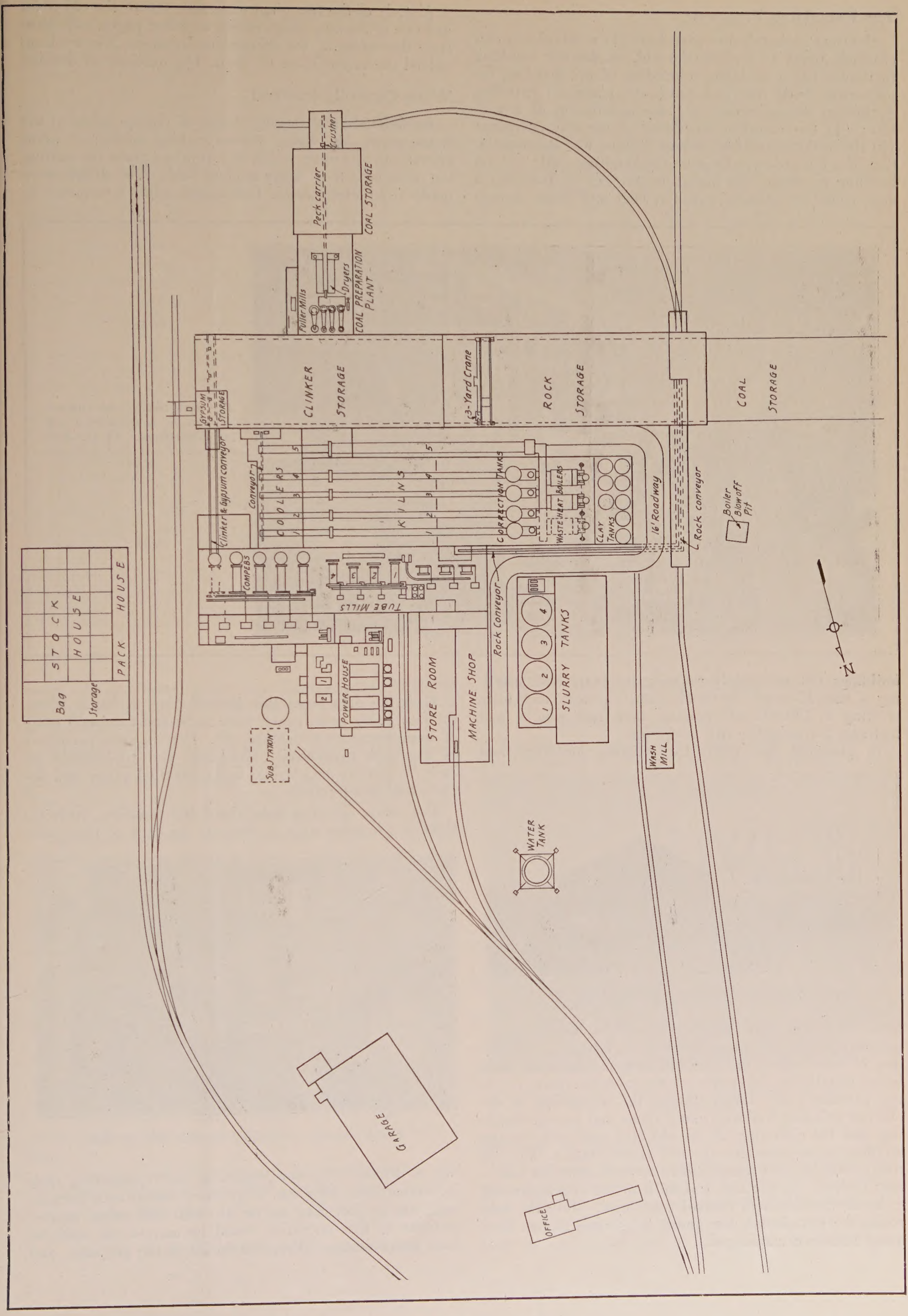
In 1924, Wm. H. Baker became president of the Acme Cement Corporation, which, up to that time, including 1924, had shown steady losses. The plant at that time was considered generally inadequate for economical production. The new operating organization improved conditions somewhat and a little later the company successfully undertook the financing of the big improvement program which has since been completed. During the construction period the plant was sold to the North American Cement Corporation. Mr. Baker remained to complete the construction program and then left the plant to engage in consulting practice, as noted on another page in the "Men and Mills" section, in this issue.

The old and the new rock bins at the quarry of the Acme plant. The new reinforced concrete bins were built as a part of the modernization program





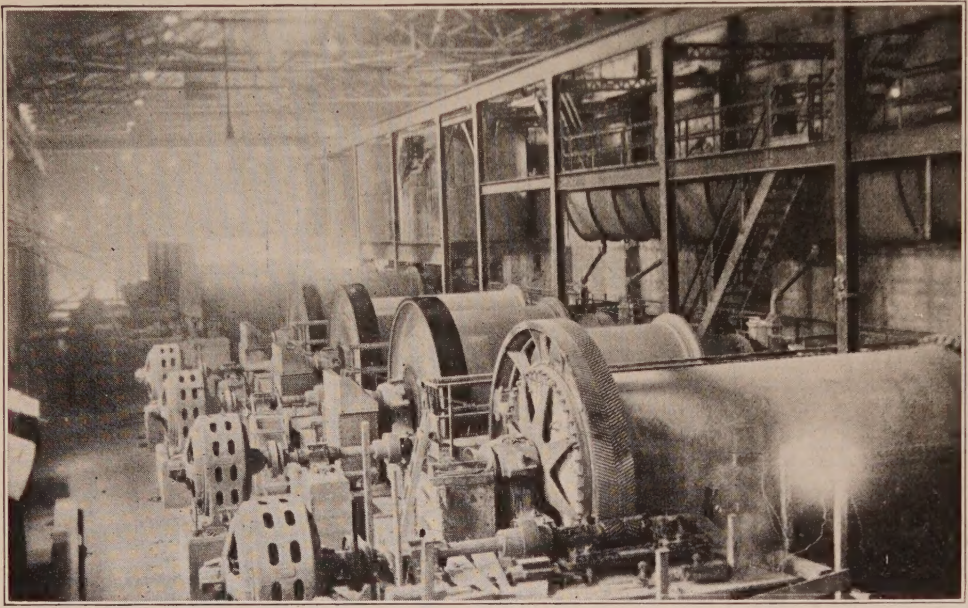
The old plant layout



The plant as it is today

The Rebuilding Program

The work undertaken consisted of: (1) a completely new crushing plant to replace the old, inadequate crushing facilities; (2) a complete rebuilding of the grinding departments, both raw and finish, to place all grinding equipment in one room; (3) the installation of a fifth kiln; (4) the complete rebuilding of the slurry system; (5) the installation of waste heat boilers; (6) the installation of a Fuller-Kinyon system for handling coal; (7) rebuilding the shops and materials storage; (8) erecting a new, combined clinker, gypsum, coal and stone storage building; (9) completely rewiring the plant and installing a new 27-panel electrical control system, and (10) erecting a 100,000-gallon water tank and pumps and hydrants for complete fire protection.



The tube mills and compeb mills in the modernized grinding department. All grinding equipment was placed in one room

In planning this work, the existing buildings and equipment were used wherever possible. The program necessitated the erection of a new storage building, alteration of one end of the kiln building for the waste-heat boiler installation, alteration of the grinding room, which was previously the clinker storage, the remodeling of the old raw grinding building into a shops and storage building, and the alteration of the old clay and rock storage building to accommodate the new slurry system. The old slurry building was remodeled to accommodate the waste-heat boilers. An addition was built to the grinding room to house the electrical control equipment. Only the kiln room, the coal house, the power house and the packing house remained unchanged.

The new materials storage building

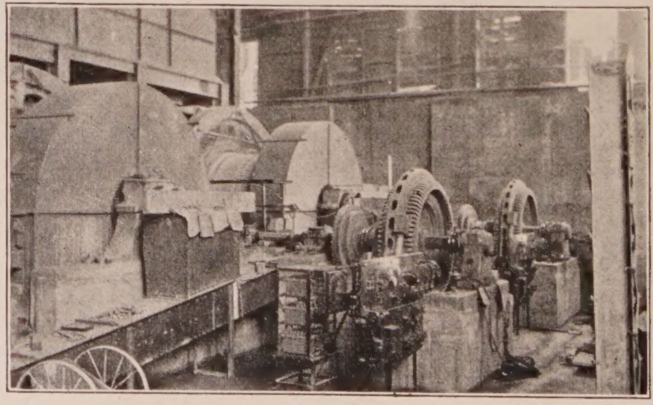
A study of the two plant diagrams, one of the old plant and one of the new plant, shown on other pages, will illustrate the extent of the changes undertaken. The work involved the expenditure of about 1½ millions of dollars.

Work Carefully Planned

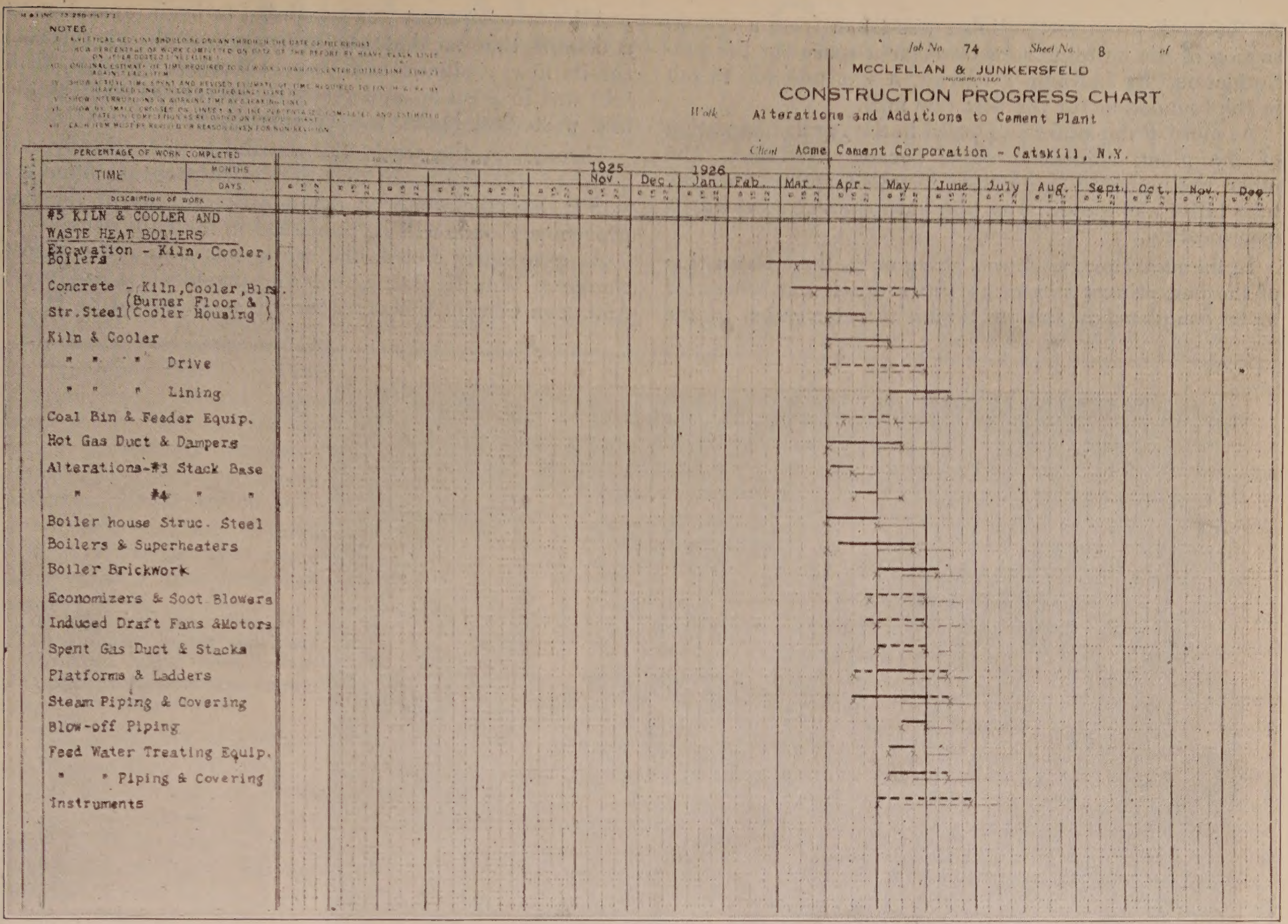
Immediately after taking charge of the operation of the Acme plant, Mr. Baker started making studies of plant operation costs upon which to formulate plans for putting the plant on a thoroughly modern basis. The studies were made from every angle that might effect economies in operation.

With the data from this investigation at hand, plans for rebuilding as indicated were made and a general plan of improvement was worked out. Details were perfected as the work progressed. McClellan and Junkersfeld of New York were retained to make detailed plans and do the actual construction.

The entire job was subdivided into smaller projects. Definite schedules were worked out for each of these, setting a definite time for beginning and completing each individual job. This was of primary importance because each sub-project had to tie in with the other related projects so that operation could be maintained with the least inconvenience. Progress on all of the projects—and



The preliminators installed in their final position



One of the project schedule sheets illustrating the method used to schedule each operation

many projects were under way simultaneously—had to proceed according to schedule to prevent a stoppage of manufacturing operations.

Schedule sheets were prepared for each project, listing the necessary operations in sequence and setting a definite percentage of the operation to be completed each week. The schedule sheets, one of which is reproduced, were checked each week with the actual performance record.

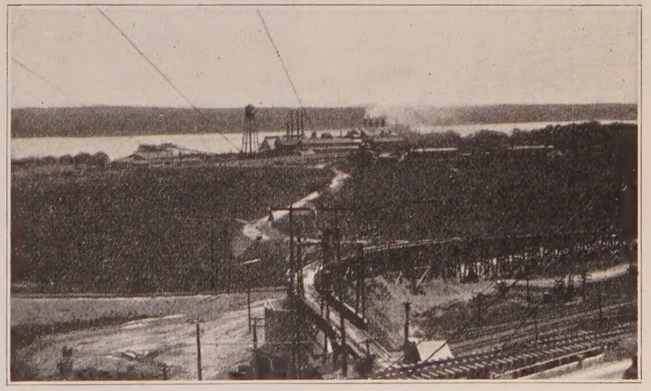
Operation changes, made necessary as the work progressed, were also scheduled and these schedules were planned to dovetail with the construction program. Throughout the job, the mill continued in uninterrupted operation because of the care and foresight with which the work was planned. In fact, the full capacity of the mill was maintained without interruption.

Sometimes it was necessary to operate departments in excess of their normal production so as to build up reserves for short construction shut-downs or to provide for connecting up the units.

Work was started in practically every department of the mill at the same time. An indication of the activity at the beginning of the program is given in the following record of operations with which the work was begun:

1. Cutting down slurry storage and removal of old slurry tanks to make room for waste-heat boiler installation.
2. Tearing down wall between old grinding room and old clinker storage to form new grinding room.
3. Starting excavation for new clinker storage and new crusher.
4. Starting to remodel shops and storage building.
5. Starting to build concrete storage tank for rock at quarry.
6. Building new slurry tanks.

Similarly at each successive step in the job, work went on in a number of places at the same time so that as soon as one unit was completed, it would be put into operation to release another unit for rebuilding.



View showing the location of the plant on the west bank of the Hudson River

Example of Scheduling

The sequence of operations in converting the old clinker storage building into a part of the new grinding department will illustrate the actual application of the schedules.

At the beginning of the project, clinker was handled from the old clinker storage space as it always had been.

As the work progressed, clinker was taken from a certain section of the building so as to clear a space for the preliminators. By building a barrier, it was possible to put in the foundation for the first raw mill.

As more of the clinker was used in the regular operation of the plant, additional space became available. The other preliminators were then installed and one of the tube mills was moved from the old grinding room to its new location.

In the meantime, work was going on in the construction of the new clinker storage facilities which was scheduled to be completed in time to permit the conversion of the old clinker storage into the new grinding room. Then the clinker stream was diverted from the old to the new storage, even though there were no facilities completed for conveying the clinker from the new storage to the mills. These were installed while the remainder of the clinker was taken from the old room.

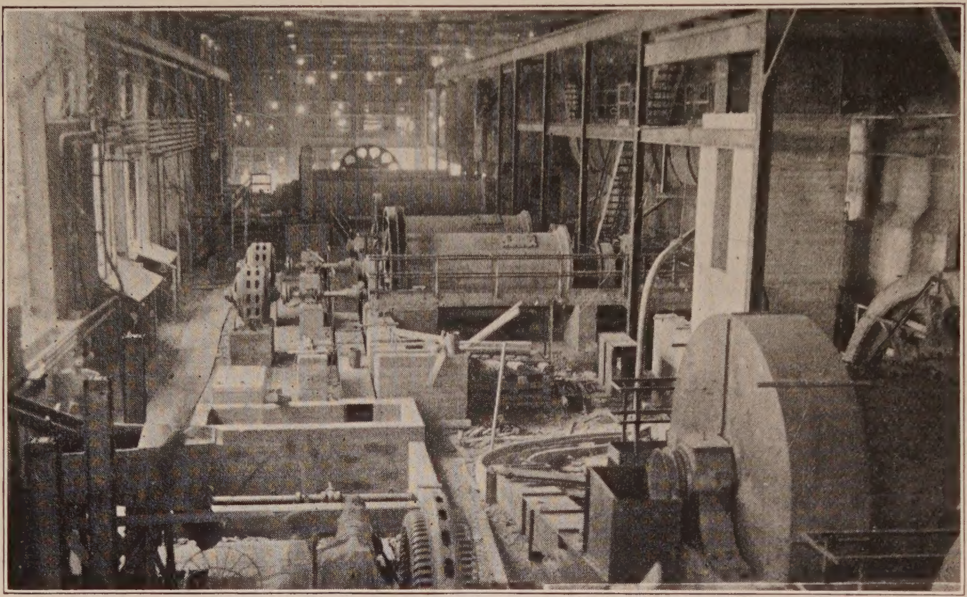
All new equipment was scheduled to begin operation at a definite time so that old equipment could be released for its new positions and uses. Likewise, the new, fifth kiln was in position and ready to operate as soon as the first waste-heat boiler was completed.

Throughout the work, the schedules were closely adhered to with the result that the entire program fitted together like clockwork. A detailed description of the improvements made will be published in the July issue.

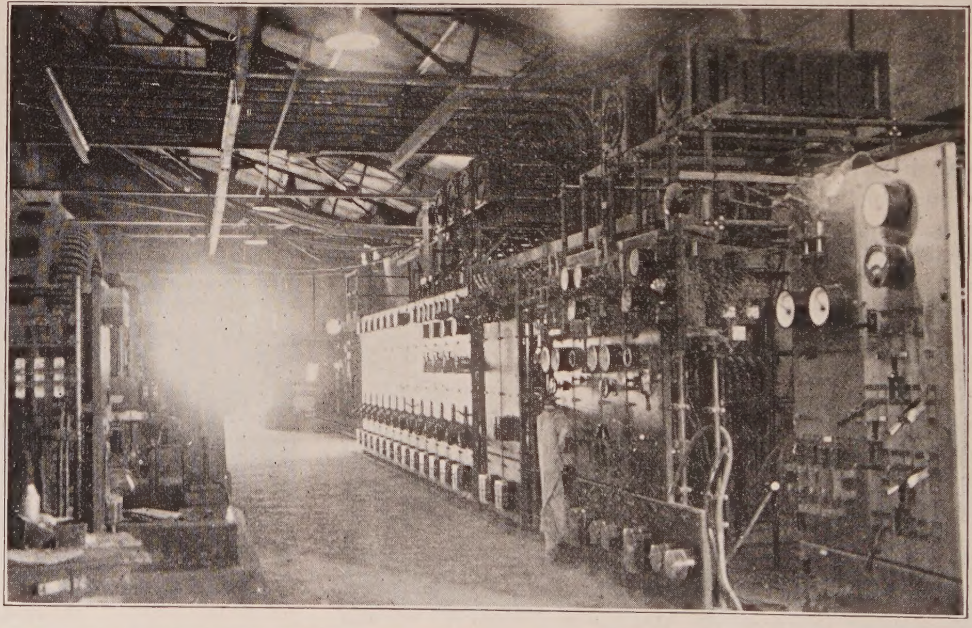
As previously noted, the work was under the direct charge of Wm. H. Baker, then vice-president of the North American Cement Corporation. He was assisted by H. H. Kessler, plant manager, and Major C. G. Spencer supervised the work of McClellan and Junkersfeld.

Other officers of the North American Cement Corporation are F. W. Kelley, president, J. J. Porter, vice-president and general manager.

(To be continued)



The mill room during the remodeling period. While some units were being installed, others were keeping the plant in operation



The control room showing the new 27-panel electrical control system

High Alumina Cements

Some Observations on the Chemical Constitution, Reactions of Hydration, Speed of Chemical Reactions and Hardening of Aluminous Cements

By HENRY LE CHATELIER*

ALUMINOUS cement, also called cement fondu or bauxite cement, presents qualities which distinguish it completely from the hydraulic products of silica—hydraulic lime, natural cement, portland cement, or slag cement. In spite of the fact that it sets very slowly it gains its strength between 24 and 48 hours, a strength equalled by portland cement only at the end of from 7 to 28 days. Mortar made with aluminous cement is of very great density and is only slightly decomposed by sulphate water. These qualities explain the rapidity with which its various uses have been developed. Because of its comparatively recent discovery it has been the subject of but few investigations as compared with silica cement. The theory of its hardening is but little developed. I propose to report some experiences which I have had on this subject.

The hardening of hydraulic mortars is a very complex phenomenon in the study of which it is advantageous to apply the principle of division of Descartes, "to separate each problem into as many detailed problems as possible." Or in other words to isolate the different factors which contribute to the final result—the solidity of the mortar. These factors are:

The chemical constitution of cement.
The chemical reactions of hydration.
The speed of these chemical reactions.
The mechanism of the crystallization of the hydrate.

Chemical Constitution

All cements are composed of intimate mixtures of a certain number of chemical combinations of whose exact nature it is difficult to state and is still only partly understood. For silica cements it is generally admitted today that the active and essential element is, as I stated a long time ago, tricalcium silicate. For the aluminous cements it is admitted that the principal constituent is monocalcium aluminate: $Al_2O_3.CaO$, but without very precise proof.

The Reactions of Hydration

According to LaFuma the monocalcium aluminate, on contact with water, is transformed into bicalcium aluminate with seven molecules of water of crystallization, and into alumina. This reaction is expressed by the equation:

$$2(Al_2O_3.CaO) + 10H_2O = Al_2O_3.2CaO.7H_2O + Al_2O_3.3H_2O$$

According to this formula, aluminous cement absorbs by hydration a weight of water equal to 88 per cent of the weight of its alumina. In reality the cement carries more lime than that which would correspond to the formula of monocalcium aluminate and consequently the amount of water fixed is also more. One is therefore in a position to state that in round numbers the aluminate of cement fondu needs for its hydration a weight of water equal to that of the alumina contained in the cement. This proportion of alumina is in the neighborhood of 40 per cent. The amount of water necessary, assuming that the calcium silicate remains inert, is therefore about 40 per cent of the weight of the cement. This is an amount about twice that which is fixed by the better portland cements.

As a result of this higher proportion of water fixed in hydration, aluminous cement makes mortar denser than portland cement, which to a certain extent explains its greater strengths. On the other hand this density also explains the greater brittleness of casts of aluminous cement, analogous to those made from finely ground portland cement mixed neat with sea water. This density also accounts for the resistance of aluminous cement to the decomposing action of sulphate water. Non-penetration of foreign salts is not only due to physical causes, but to the low amount of lime in aluminous cement as well, which presents a chemical obstacle to the formation of calcium sulpho-aluminate.

The high proportion of water necessary for the hydration of aluminous cement also presents a grave inconvenience. The quantity of mixing water ordinarily employed in concrete does not greatly exceed the minimum quantity necessary for complete hydration of the cement.* All loss of water by drainage, evaporation, or other means results in a lowering of the strength of the mortar. This justifies the recommendation that mortars made with aluminous cement be mixed rather wet and sprinkled continuously during their hardening.

Speed of the Chemical Reaction

The rapidity with which aluminous cement hardens is the result of the speed with which hydration takes place. It is interesting to measure the exact rate of this reaction carefully. The determination of the duration of the initial set, or of the compressive strengths of the mortar at successive intervals does not provide exact information on this subject because the phenomenon of hardening does not depend entirely on chemical reaction, but also to a considerable extent on the form and dimensions of the products of crystallization.

On the other hand, it is possible to follow the progress of the chemical reaction very closely by a method which I have employed previously in my studies of plaster (gypsum). The combination of water with anhydrous salts is accompanied by an important contraction, sometimes as much as one-third of the volume of combined water. I have measured this contraction exactly in the following simple experiments:

Take a test tube of 25 cubic centimeters capacity and fix a glass tube 5 millimeters in diameter (interior) and 200 millimeters long to the open end by means of beeswax. Introduce 10 cubic centimeters of water with a slender glass tube. Then pour in a mixture of 10 grams of cement and 20 grams of Fontainebleau sand. Agitate the mixture sufficiently to eliminate all air bubbles, and add water to the level of the narrow tube. Then affix a

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*Translated from *Le Ciment*, March, 1927.

*This would hardly be true of American mixes.

rule to the side, placing the zero of the scale at the curve of the test tube. Close the tube tightly to avoid evaporation. A previous calibration has served to facilitate the conversion of readings on the rule to cubic centimeters.

Here are the results of a test made at a temperature of 15 degrees Centigrade (59 degrees Fahrenheit). Divisions of the tube were of exactly 0.2 cubic centimeters. The time is expressed in hours and days, the contraction in cubic centimeters.

Time (Hours)	2	3	4	5	7	11
Contraction	0.02	0.07	0.10	0.17	0.58	0.92
Time (Days)	1	2	6	9	12	
Contraction	1.03	1.08	1.12	1.16	--	--

The limit of the contraction seems to be about 1.2 cubic centimeters for 10 grams of cement. If that much cement fixes 4 grams of water, the contraction will be equal to 30 per cent of the volume of water combined.

The curve shown as Figure 1 summarizes the results of these tests. The curves shown above the lowest ones are those of the successive days following the first 24 hours. The amount of contraction is shown at various periods of time.

Speed of Hydration

In order to determine how the speed of hydration varies with temperature these experiments have been made at the temperatures of 2, 15, 30 and 50 degrees Centigrade (35 degrees, 59 degrees, 86 degrees and 122 degrees Fahrenheit). The curve shown as Figure 2 summarizes the results.

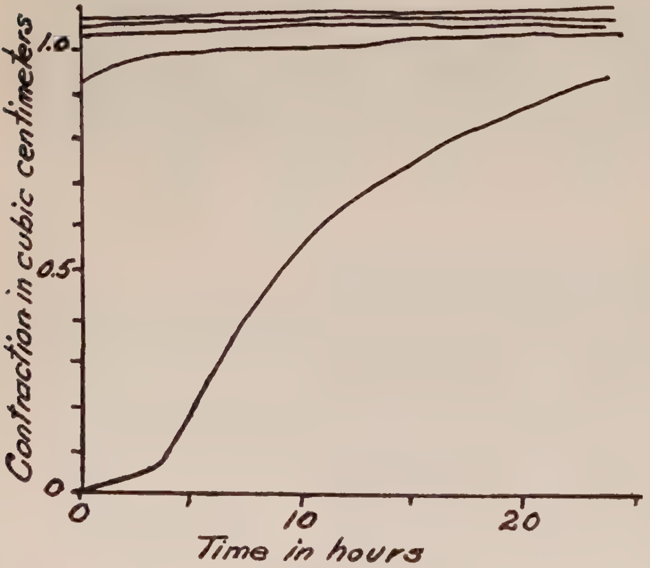


Figure 1

On the same chart is shown the result of replacing the water by a 1 per cent sugar solution. M. Rengade some time ago expressed himself of the opinion that sugar greatly slows up the hardening of cement fondu, without interfering with the final strength. It has likewise been noted that if the observations are continued for 15 days, the contraction tends to be practically that obtained with clear water.

The following are some figures used in developing these curves:

	Pure Water				1% Sugar Solution
Temperature C.	2°	15°	30°	50°	15°
After 2 hours	0.02	0.04	0.10	0.43	0.00
After 4 hours	0.05	0.10	0.23	0.70	0.03
After 8 hours	0.20	0.40	0.65	----	0.09
After 12 hours	0.37	0.63	0.72	----	0.12
After 16 hours	0.53	0.73	0.85	----	0.15
After 24 hours	0.80	0.92	----	----	0.17

Temperature Rise

This speed of reaction carries with it a pronounced rise in the temperature of the mortar, so great in fact that in mass concrete it delays the return of the mass temperature to normal for some time.

M. Chàssevent has made measurements of the heat generated. His method consists of observing the rise in the temperature of a mortar in a calorimeter immersed in water, the temperature of which is maintained constant by means of an electric current at that of the specimens being studied. He has made the experiment with a mortar composed as follows:

	Grams
Aluminous cement	100
Fontainebleau sand	300
Water	80

The rising temperature observed has been as follows:

Temperature in degrees C.

Hrs. 1	2	3	4	6	8	10	11	12
1.0	2.0	3.5	6.3	17.5	30.0	45.0	50.0	50.0

Temperature in degrees F.

Hrs. 1	2	3	4	6	8	10	11	12
1.8	3.6	6.3	11.3	31.5	54	81	90	90

The total rise was 50 degrees Centigrade (90 degrees F.). It will be noted that the rise stops abruptly in spite of the fact that it would seem natural to suppose that the production of heat should diminish progressively in proportion to the remainder of unhydrated cement. This slowing up of temperature rise does not come about because the higher temperatures speed up the reaction and so compensate the diminution of the active elements.

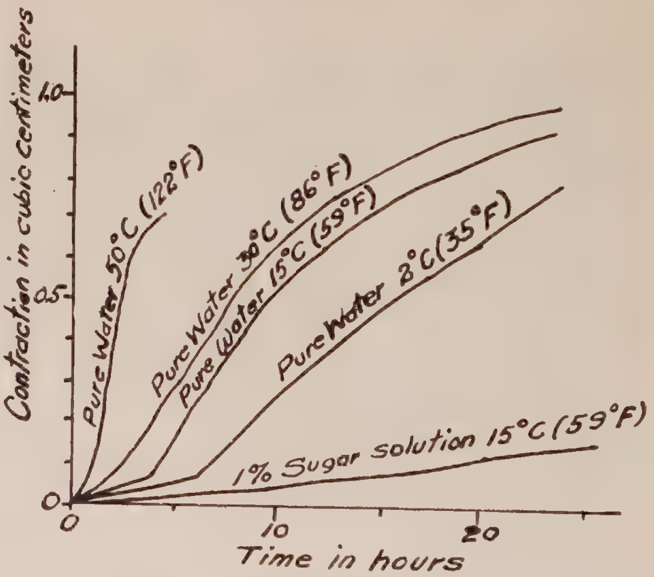


Figure 2

The results obtained make it possible to calculate the heat thrown off during the hydration of cement. Taking for specific heat of cement .19, of sand .20, and of combined water .5, we find: 7.35 kilogram-calories for 100 grams of cement.

With these data, it is possible to calculate the temperature which would be obtained in a mass of cement mixed with 40 per cent its weight of water and enclosed in a container impermeable to heat and to gas or vapor. The resulting figure is 190 degrees Centigrade (about 342 degrees F.). This explains the violent explosions obtained with large cubes of pure aluminous cement. The tension of the steam generated in the center of the mass reaches a considerable number of atmospheres.

The temperature in the mortar accounts for a fact recently observed. After their solidification, great masses of concrete present a strength at the core which is considerably less than that at their outside surfaces. This is particularly true when, by reason of poor exterior cooling, the temperature has been allowed to rise more than 50 degrees C. above the atmospheric temperature.

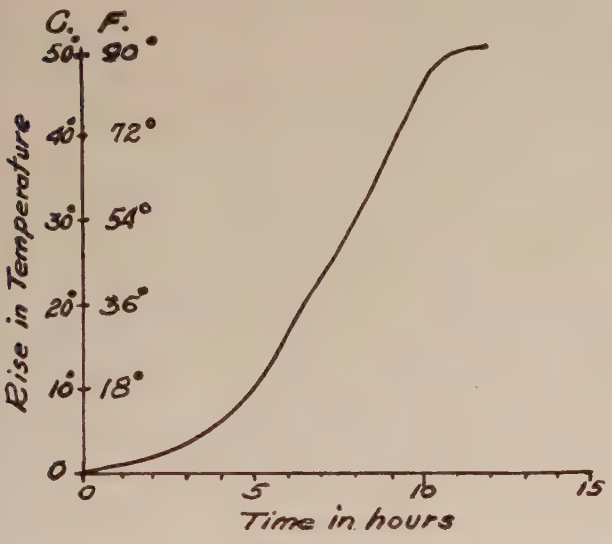


Figure 3

At this temperature the tension of water vapor is sufficient to cause an evaporation of the water from the interior of the mass which would normally condense against the cooler outside surface. As a result there is not enough water left at the center of the mass to permit proper hardening.

Crystallization

The mechanism of the crystallization of hydrates formed during hardening is that which I outlined some time ago in discussing hydraulic mortar. Calcium aluminate (anhydrous) is much more soluble than hydrated aluminate. According to M. LaFuma, cement fondu shaken in water dissolves in an hour about 3 grams of alumina and lime per liter whereas the solubility of the hydrated aluminate is ten times less. It (the anhydrous aluminate) forms a supersaturated solution which little by little crystallizes into the hydrated salt.

It is known that the forms and dimensions of crystals which separate from the solution vary greatly with conditions, notably with the concentration and temperature of the solution. The crystals deposited by supersaturated solutions are generally fine splinters of which the length is often more than 100 times the diameter. It is probable that the presence of sugar opposes itself to this elongation of the crystals and so slows up the hardening. This is not complete until all of the voids between the grains of sand are filled up with the hydrated salt. The hydration is accordingly retarded by the fact that when the crystals are but little elongated they form a sheath more or less impermeable to water around each grain of cement not yet hydrated. Hydration is accordingly slowed up.

Supersaturation complicates the reactions which accompany hardening. There exist two hydrated calcium aluminates.

$$Al_2O_3.2CaO.7H_2O$$
$$Al_2O_3.4CaO.12H_2O$$

The first alone is stable when hydration is completed, but in the presence of the initial supersaturated solution the second is also able to produce itself in a transitory form, and it disappears only when hydration is completed. This phenomenon is observed in the crystallization of supersaturated solutions of sodium sulphate. There exist two hydrates of this salt of which that containing 10 molecules of water of crystallization is stable. In the presence of supersaturated solutions of anhydrous sodium sulphate in water, there is formed a crystal of 7 molecules of water of crystallization. This phenomenon is frequently observed when a saturated solution of sodium sulphate is cooled rapidly in a test tube.

It is possible for a second complication to arise which has not yet been observed in the case of calcium aluminate, but which will probably be encountered sooner or later. When water is mixed with an anhydrous body to form a solution without previous dissolution, this combination is always accompanied by a swelling which destroys all the cohesive qualities of the mortar. If a sack of gypsum, or even of certain cements, is left in damp air it will "become lifeless," that is to say, it will combine with water vapor. It will at the same time swell sufficiently to break the sack in which it is contained. But on the other hand, in the presence of liquid water instead of water vapor the combination takes place without swelling.

Certain bodies even in the presence of water in the liquid state swell considerably, as is the well-known fact in the case of lime, anhydrous borax, etc. But under other conditions lime combines with water in crystallizing and contributes to the durability of mortar. This is true of the hydrate of lime which is formed as a result of the action of water on tricalcium silicate. These crystals of hydrated lime are one of the important elements in the hardening of portland cement.

It is not impossible that certain anhydrous aluminates are able at high temperatures to combine with water without previous dissolution and to result in swelling that is very harmful to the solidity of the mortar, but for the moment this is but a theoretical hypothesis which it will be interesting to study experimentally.

Standard Speeds Proposed for Machinery

Standardization on a national scale of the speeds of machinery is proposed by the National Electrical Manufacturers Association in a request to the American Engineering Standards Committee to take the matter up with the purpose of simplifying and clarifying the existing situation which is stated to constitute a serious burden on industry through the resulting waste and confusion.

The electrical manufacturers believe that the proposed standardization which should result in a relatively small number of coordinated speeds for the almost innumerable kinds of machinery, would afford an easy approach to the problems of simplification and standardization of pulleys, gears, sprockets, etc., and would permit much greater flexibility in the selection and use of both power units and driven machinery, greatly promoting interchangeability of such units, and providing economies for innumerable industries dependent upon such equipment.

Significance of Free Lime in Hydraulic Cements

A Description of British Experiments Made to Develop a Method of Estimating Free Lime in Hydraulic Cements

IN Great Britain as in most other countries calcareous hydraulic cements, notably portland, are some of the most widely used materials for building purposes. It is pretty well known that by sintering or fusing together mixtures of limestone rocks or similar materials with clay or other earthy materials, the resulting products when finely ground and mixed with water, set and harden. The ingredients can, for the most part, be determined before the firing of the composition takes place. But the actual re-combinations which occur in the furnace, and the further compounds that are formed with the addition of water and in the subsequent setting and hardening are not known with any degree of certainty. Many different conjectures have been made, and widely different opinions are held as to the possible constituents of portland and other cements as they occur in practice; but among the few points in which there is a general concensus of opinion is the fact that, as a rule, free slaked lime is present and has an important bearing on the properties of the cement.

Under these circumstances it is, therefore, by no means surprising that the Building Research Board of the Department of Scientific and Industrial Research, which has a variety of the uncertainties of building practice under experimental investigation, has received almost innumerable requests from others engaged in similar investigations for some guidance in the choice of methods for estimating free lime in hydraulic cement. The results of the observations on the subject made by F. L. Brady and F. J. McCormack, have recently been published.

Of the many methods of estimation that have been examined the report describes the results of four, two wet and two dry. As usual with the Research Department's work, no attempt is made to force on any experiments the results that are being sought, and it is evident that even the best of these methods has not an ideal or universal accuracy. The candor, however, with which the report sets forth the reservations that have been made enables its recommendations to be received with confidence, and two of the methods can therefore be welcomed as having practical value in a very important determination. The experiments were made on a considerable variety of cements, including an ordinary and good portland cement, two British Portland blast-furnace cements (mixtures of about 60 per cent blast furnace slag with 40 per cent portland cement), a French cold-process slag cement, and a French quick-hardening (high alumina) cement, tested both in the set and the unset conditions.

The wet methods depend on dissolving lime by solutions of phenol and sugar respectively. Each of these gave results that varied for a given cement (and therefore a given percentage of lime actually present) with the concentration of the reagent, its volume, and the time allowed for extraction. The sugar solution showed much less variation with these factors than the phenol; and although neither proved suitable for estimations in unset cement, the sugar method is recommended as giving a useful indication of the free lime in set cements. It has the advantage of requiring only a very small sample (0.2 gramme), and taking only some seven or eight minutes to perform.

One of the dry methods depends on the reaction between slaked lime and ammonium carbonate when gently heated, resulting in the production of carbonate of lime as the sole solid residue, the carbonic acid in which can be estimated. Another product of the reaction is, however, water, which introduces the probability of a further hydration, and this is aggravated by the presence of more water in the ammonium carbonate. As an alternative, therefore ammonium carbonate was substituted, which does not give off water on heating, all the hydrogen being used to form ammonia. The results, though in some cases much lower, were irregular. The most satisfactory method depends on measuring the heat evolved by hydrating the calcium oxide that forms in cement when heated to a suitable temperature. This method was developed in connection with investigations into probable fire-resistance, and its chief value may be found in that application, though it is exceedingly likely to be useful for other purposes. As the report observes, the precise chemical and physical condition of the lime in cement is not clearly known, and though accordingly it seems that no assay yet available will give results that are valid under all conditions, the present tests afford valuable and otherwise unobtainable evidence on the condition and probable behavior of set and unset cements.

Whatever may be its actual composition, dry cement as at present manufactured is composed of two main parts—the crystalline "alite" and a glassy mass. The crystals are richer in lime than the glassy mass, and when water is added to the ground mixture it hydrates the lime in the alite rapidly. Thus each particle becomes coated with more or less impermeable products, including slaked lime, and inside this coating remain further quantities of unattached alite and ground mass, which are available for fresh hydration should the impermeable envelope be disturbed. This circumstance causes a chief difficulty in estimating free lime in set cement, and accounts also for a good deal of the disintegration that occurs in practice or can be produced experimentally.

Sugar, for example, will combine with lime, and even in relatively small quantities may disintegrate fully set and hardened cement. Other organic substances,—peaty matter, lactic acid, many oils and gases—act similarly, and so do some common inorganic substances, such as ammonium salts and magnesium chloride, the latter probably the most active ingredient of sea water in its attack on cement. Among the constituents that are most often attacked is free lime, and the process is aggravated by the hydration of material exposed by the decomposition of the envelope, which is accompanied by an increase in the volume and produces therefore a mechanically disintegrating force. This is seen in the much greater and sometimes complete resistance to magnesium chloride shown by portland blast-furnace cement as compared with ordinary cement, owing to the formation of insoluble compounds between the lime of the cement and the components of the slag.

EDITORIALS

Cement Imports

THE alarm that has been voiced by some American cement manufacturers over the growing imports of foreign cement has penetrated to the sources of that cement, where we suspect it has aroused a little alarm on its own account. One French publication has expressed its reaction to the situation in the single sarcastic phrase: "Poor America!"

Much has been said and written on the subject here in America, but the general view of the matter seems to have settled down into a rather resigned, "Well, it's less than 2 per cent that is imported. And anyway it only affects the eastern seaboard." Here in Chicago where this is written only a few seem very excited about the matter.

We wonder if the rank and file of the industry have just the right conception of the situation. True enough, two per cent of our cement production is not enough to affect the industry's prosperity seriously, although some eastern mills may feel the loss of business rather keenly. But the real danger of the situation lies in the fact that export business is an absolute necessity to the prosperity of the European cement industry, and it dares not and will not willingly relinquish any foothold it may gain in any market, American or otherwise.

No one knows better than the cement manufacturer how much more expensive it is to produce cement in a plant running at partial capacity than in one operating at full capacity. And it is just this fact which is going to make European manufacturers go to almost any length to hold the market necessary to keep their plants running at or near capacity. American plants cannot hope to compete with them in price unless they are willing to dump cement at cut prices in sections of their own market. And even if they did this, the ultimate effect would be to extend the market for European cement, by bringing the competing coast price down to a point that would encourage inland buyers to go into the eastern market for their cement.

In other words the cement industry is facing one of three alternatives: A partial loss of the seaboard market, a disastrous price war, or a prohibitory tariff. The dangers in this last expedient are obvious, but not inevitable. Judiciously varied, under the control of an alert executive, it should prove the safest course. And we believe that it is high time the full political influence of the American cement industry is exerted to this end.

State Cement Plants

PRONOUNCED activity in introducing bills authorizing the establishment of state-owned cement plants seems to be the order of the day. In Indiana, Wisconsin, Arizona, Texas and Arkansas the question is now either before the legislatures or plans are made to introduce bills.

The experiences of the South Dakota and the Michigan state plants do not seem to act as deterrents. All that seems to be necessary is to appropriate a million or a million and a half dollars for a cement plant and then force the state highway department to buy the cement for building concrete roads. Such matters as the cost of manufacturing the cement, earning a return on the investment, and the effect of state plant operation on private industry do not seem to carry weight.

There is a mistaken impression abroad that cement is easy to make and that is probably one reason why state cement manufacture comes up for consideration periodically in one state or another. As a matter of fact, the state cement plant is up against the same problems that the private manufacturer must solve. In some instances these problems are even greater for state plants.

The cement industry is in a state of flux. Newer, more efficient production methods and equipment are constantly being developed. Privately owned plants can take advantage of these improvements more easily than state plants. It is difficult to get successive appropriations from any legislature for modernizing and improving a cement plant. The executives of commercial plants can afford to invest in better equipment because it means lower operating costs. The result is sure to be that politically controlled plants will be at a disadvantage and the taxpayer foots the bill whether he knows it or not.

Private enterprises as a rule can employ better men than public enterprises. Salaries are usually fixed by law and the outstanding men in the industry find themselves in the employ of cement manufacturers who pay well for their ability to produce a quality product economically.

It is a well known fact that to produce cement economically, a plant must run without shutdowns. In serving only a seasonable market, like highway construction, it is difficult to maintain operation on the most economical basis. Nor can a state plant hope to sell cement in quantity in competition with the aggressive selling of the privately owned companies. The highway market of most states is not nearly great enough to warrant the construction of a cement plant to serve the market alone.

The time to prevent the manufacture of state cement is before the plant is built or bought. If the facts are put squarely before the taxpayer, it is reasonable to expect that he will not sanction the building of a state plant. It is the responsibility of the cement manufacturers to do this. Especially now, when production capacity already exceeds the demand, the establishment of additional state-owned plants should be discouraged.

Cement Statistics for April

APRIL production and shipments of portland cement show increases, respectively, of nearly 13 and 11 per cent over the corresponding period in 1926, according to the Bureau of Mines, Department of Commerce. Production was the highest for any April, and shipments were exceeded only in one other, April, 1925. Portland cement stocks at the end of April decreased slightly but are second only to those at the end of March and are over 4 per cent greater than the stocks at the end of April, 1926.

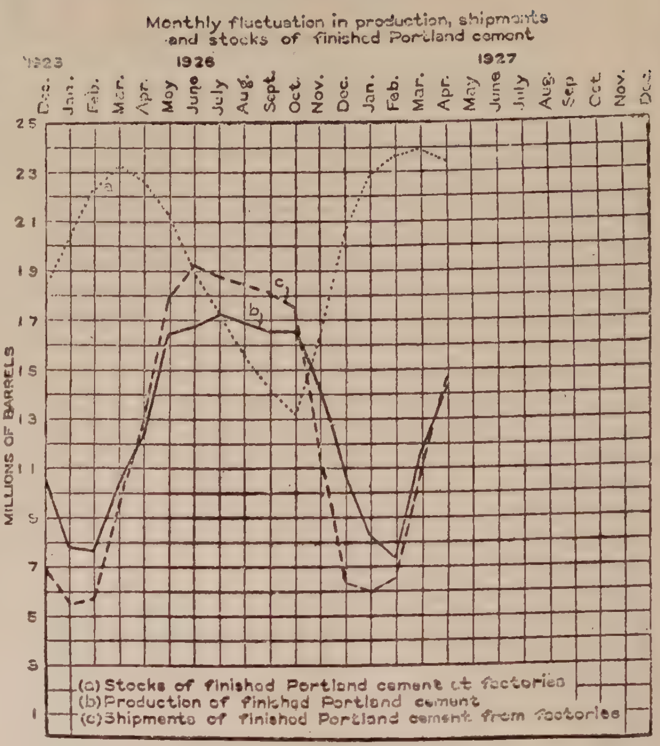
The output of another new plant located in Western Pennsylvania is included for the first time.

Estimated Clinker (Unground Cement) at the Mills at End of Each Month, 1926 and 1927

(Figures represent thousands of barrels)

Month	1926	1927
January	9,074	9,989
February	10,931	11,943
March	12,290	*12,997
April	12,967	13,338
May	11,695	
June	10,144	
July	8,604	
August	7,362	
September	6,112	
October	5,370	
November	5,748	
December	7,799	

*Revised.



Production, Shipments and Stocks of Finished Portland Cement, by Months, in 1926 and 1927

(Figures represent thousands of barrels)

	Production		Shipments		Stocks at end of month	
Month	1926	1927	1926	1927	1926	1927
January	7,887	8,258	5,674	5,968	20,582	22,914
February	7,731	7,377	5,820	6,731	22,385	23,560
March	10,390	11,452	9,539	11,083	23,236	*23,922
First quarter	26,008	27,087	21,033	23,782		
April	12,440	14,048	12,965	14,350	22,710	23,620
May	16,510		17,973		21,255	
June	16,866		19,134		19,000	
Second quarter	45,816		50,072			
July	17,134		18,812		17,301	
August	16,995		18,583		15,718	
September	16,571		18,087		14,188	
Third quarter	50,700		55,482			
October	16,596		17,486		13,334	
November	14,193		11,276		16,243	
December	10,744		6,432		20,616	
Fourth quarter	41,533		35,194			
	164,057		161,781			

*Revised.

Commercial District	Production—April		Shipments—April		Stocks at end of April		Stocks at end of Mar., 1927*
	1926	1927	1926	1927	1926	1927	
Eastern Pennsylvania, New Jersey, and Maryland	3,258	3,640	3,679	4,163	5,311	5,154	5,677
New York	517	898	660	843	1,485	1,624	1,568
Ohio, Western Pennsylvania, and West Virginia	1,248	1,409	1,195	1,301	2,792	3,380	3,272
Michigan	762	1,056	610	963	1,931	2,068	1,975
Wisconsin, Illinois, Indiana, and Kentucky	1,400	1,552	1,550	1,623	3,816	3,277	3,348
Virginia, Tennessee, Alabama, and Georgia	1,260	1,354	1,311	1,385	1,059	1,147	1,178
Eastern Missouri, Iowa, Minnesota, and South Dakota	1,134	982	1,142	977	3,078	3,231	3,226
Western Missouri, Nebraska, Kansas, and Oklahoma	854	964	899	791	1,443	1,757	1,584
Texas	411	469	447	491	501	425	448
Colorado, Montana, and Utah	240	210	225	194	322	486	470
California	1,009	1,177	958	1,263	553	606	692
Oregon and Washington	347	337	289	356	419	465	484
	12,440	14,048	12,965	14,350	22,710	23,620	23,922

*Revised.

MEN and MILLS

Notes from the Field

Professor Abrams Becomes Director of Research for International Cement Corporation

Duff A. Abrams, for Eleven Years in Charge of Portland Cement Association Research Laboratory, Joins International Cement Corporation

Professor Duff A. Abrams has been appointed Director of Research by the International Cement Corporation. Plans for the construction of a research laboratory, to be under Mr. Abrams' charge, are under way. As Director of Research for the International corporation, Mr. Abrams enters upon the third decade of his distinguished career, with unlimited scope for his endeavors.

Professor Abrams was born April 25, 1880, at Grand Tower, Illinois. After graduating from high school at Murphysboro, Illinois, he entered the University of Illinois in 1900 and received a B. S. degree in civil engineering in 1905. From 1902 to 1904 he worked on two concrete construction projects in Illinois. From 1905 to 1914 he was a member of the staff of the Experimental Station of the University of Illinois engaged in research work on the properties of concrete, reinforced concrete, timber, steel, etc.

Mr. Abrams was Professor in Charge of the Structural Materials Research Laboratory, Lewis Institute, Chicago, from 1914 to 1926, where an extensive research program was carried out on concrete and concrete materials through the co-operation of the Portland Cement Association. In July, 1926, Professor Abrams became Director of the Research Laboratory of the Portland Cement Association, Chicago, when this work was merged with the other activities of the Association.

Professor Abrams is a Fellow of the American Association for the Advancement of Science; vice-president of the American Concrete Institute, and is a member of the American Society of Civil Engineers, American Society for Testing Materials; American Ceramic Society; Engineering Institute of Canada; Western Society of Engineers and Sigma XI. During the past seven years he has been secretary of the Joint Committee on Concrete and Reinforced Concrete; this committee consists of representatives of five national engineering societies.

250 Lehigh Valley Leaders Pledge June Safety

Two hundred fifty leading cement mill executives attended the annual safety conference for the Lehigh region at the Elks' Club, Allentown, Pa., on the afternoon and evening of May 19th.

Chairman Russell Frame of the Alpha Portland Cement Company in calling the meeting together stated that the paramount issue was whether they could operate a month without accident, and the business of the meeting was to prepare to win June No-Accident Campaign.

One of the high points of the meeting was reached when Chairman Frame pleaded for recognition of the workmen who can speak and read only a foreign tongue. To demonstrate the point he invited D. A. Farace, a foreman in the Alpha Portland Cement Company's plant at Martin's Creek, Pa., to make a safety address in Italian. Mr. Farace talked with such earnestness, however, that the audience got much of the spirit of his remarks, although unable to get the exact meaning of his words.

The annual banquet of the Lehigh valley cement safety men was held in the evening.

Cement Plant Engineers Form Own Firm

William A. Baker and Major C. G. Spencer have organized the firm of Baker and Spencer, Engineers, New York City, for the general practice of engineering.

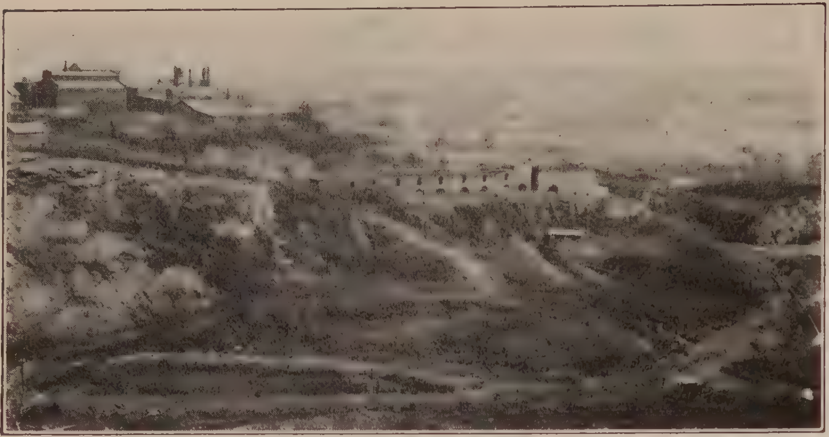
Mr. Baker secured his early cement education in the Atlas plant at Northhampton, where he remained until 1920, leaving only for a short time to build the Kosmos plant. After devoting several years following to cement plant construction and powdered coal equipment, Mr. Baker became president of the Acme Cement Corporation, which, under his leadership, for the first time, in 1925, produced good earnings.

After a period of improvement and reconstruction, during which the plant was sold to the North American Cement Corporation, Mr. Baker resigned from his position as president, remaining, however, on the Board of Directors.

Major Spencer's principal experience has been with the industrial power plants and electrification and heating in an variety of industries. He was connected for nine years with Westinghouse, Church, Kerr and Company, three years with the Toronto Power Company, two years with the Chile Exploration Company in South America, as well as spending two years in the United States army, two years with the American Sugar Refining Company, and five years with McClellan and Junkersfeld, Incorporated.

Canada Cement Company Buys Dock Facilities

The Canada Cement Company, Limited, has purchased twenty-four gypsum properties at Antigonish Harbor, Nova Scotia, with good shipping facilities. Work will begin immediately on docks for steamers of 10,000 tons. Quarries will be equipped with crushers and storage facilities.



A bird's-eye view of the ruins of the kilns where the first portland cement made in the United States was manufactured. This was Mill A of the Coplay Cement Mfg. Co. at Coplay, Pa. On the hill at the left is the old "Valley" mill of the Atlas Co. (now abandoned). The city across the Lehigh River is Northampton

Engineers' Club Elects New Members

The Engineers' Club of the Lehigh Valley recently elected as its president Mr. R. Woodward of the Lehigh Portland Cement Company, and as vice-president, Joseph Brobston of Nazareth.

The following is a list of new members: Edward E. Dreisbach, Nazareth Cement Co.; J. Stanley Downs, Hercules Cement Corporation; Geo. B. Ebersole, Fuller-Lehigh Company; W. T. Hack, Hercules Cement Corporation; Thos. N. Haffner, Phoenix Portland Cement Co., H. S. Hangen, Bates Valve Bag Company, J. H. Heintzelman and F. B. Leh, Phoenix Portland Cement Co.; Fred A. Mertz, Phoenix Portland Cement Co., and Henry R. Renninger of the Lehigh Portland Cement Company.

Intensive Safety Campaign Inaugurated

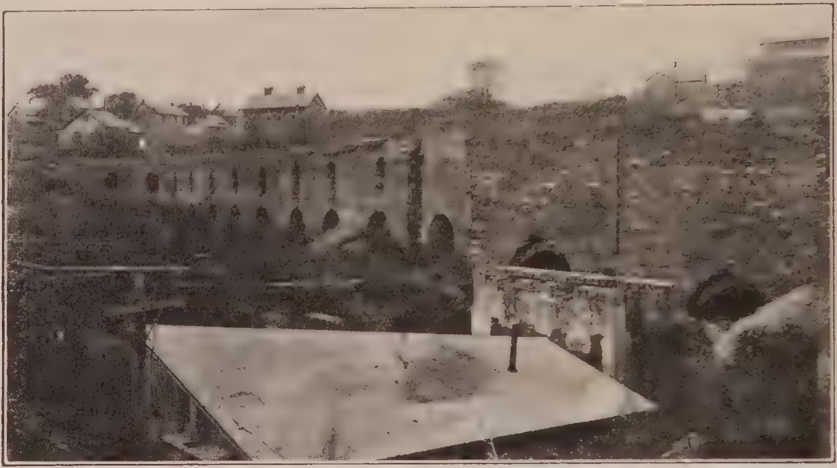
Eighty principal executives of cement manufacturing companies from Canada to Argentina; one hundred forty of the one hundred fifty cement plant superintendents, and over 2200 cement mill and quarry foremen and department heads of the above organizations have signed solemn promises to wipe accidents from the records of the cement industry for June and as much longer as they can continue. Every one of these men has promised, as far as humanly possible, to protect those working under him. Every man has backed his verbal promise by signing his name to the written enrollment. Now some 45,000 workmen are signing pledge cards to work safely and protect others around them during June. As we go to press over 20,000 of these remarkable pledges are already returned and are on exhibition at the headquarters of the Portland Cement Association.

International Cuts Price in Carolinas

A price cut of thirty cents a barrel is reported to have been made by the International Cement Company in Wilmington, N. C., and Charleston, S. C., territory.

Operations Resumed at South Dakota Plant

The South Dakota state cement plant at Rapid City, South Dakota, resumed operations at the beginning of May, after a winter's shutdown. Practically a full crew of men went on duty.



The two kilns at the right were the first kilns erected by D. O. Saylor and were used for making natural cement by the Coplay Cement Mfg. Co., Coplay, Pa. The third kiln was built later, also to manufacture natural cement. The balance of the kilns are the "portland kilns" used by D. O. Saylor. Note the absence of second floor doors in the natural cement kilns

Break Ground for Lawrence Mill at Thomaston, Me.

Ground has been broken at Thomaston, Maine, for the new cement mill of the Lawrence Portland Cement Company. Orders have been placed with the Bancroft & Martin Rolling Mills Company, Portland, Maine, for 1500 tons of steel reinforcing bars; with the J. P. Gerrity Company of Boston, Massachusetts, for 32 carloads of yellow pine for immediate shipment; with the Maine Sand and Gravel Company, Portland, Maine, for sand and gravel, and with Thomaston and Rockland dealers for 40,000 barrels of Dragon Portland Cement for the work.

The new mill will provide an additional source of Dragon cement, now being produced at the company's mill at Siegfried, Pennsylvania.

Universal Host at Mill to Cement Users

The Buffington, Indiana, mill of the Universal Portland Cement Company was visited by a party of fourteen business men, officials and contractors of Barrington, Illinois, recently. The group was shown through the Universal offices in Chicago, and then conveyed by bus to the Buffington plant thirty miles south. Upon returning to Chicago, the party inspected Wacker Drive.

Preliminary Plans Drawn for Southern Plant

Preliminary plant plans have been drawn for the Georgia Portland Cement Corporation, Sandersville, Georgia. Engineers are still engaged in making, surveys, borings and examinations.

Geologist Finds Limestone, Clay, Chalk and Fuel Available for Arkansas Plant

That Arkansas has the raw material for the manufacture of the 5,000,000 barrels of portland cement called for by the new highway program has been assured by Prof. W. R. Spencer of the engineering experiment station, University of Arkansas.

In explanation, Professor Spencer states that north of the Boston mountains, from Batesville to the Oklahoma line limestone and shale or clay occur in almost unlimited quantities, and from Arkadelphia southwest to the Texas line below DeQueen lies a chalk deposit suitable for use in cement manufacture. In the same territory suitable clays are also to be found.

Professor Spencer also points out that not only the constituents of cement are to be found in these territories, but the fuel needed is also available. Coal from the field along the Arkansas river is accessible for either of these districts. Natural gas may be obtained in the Fort Smith region, and in the chalk territory the pipe lines from El Dorado and Shreveport gas fields are not far from the chalk outcrop.

Secretary Davis Praises Safety Campaign

The concentrated efforts to reduce accidents, inaugurated June 1st by cement mills nationally, were praised in statements made recently by Secretary of Labor James J. Davis and Mr. W. H. Cameron, Director of the National Safety Council.

Secretary Davis said, in part, "Education is the only way to scale down industrial accidents in this country. Mechanical safeguards do their part, but the American worker should not rely on artificial devices to save him from injury. Caution must be a habit."

Mr. Cameron extended his wishes for a successful campaign and said, also: "The progress of the cement people in the conservation of lives and limbs has won the admiration and respect of every industry in the nation. We constantly refer to your fine records in our endeavor to encourage other industries to attain their own goals."

Richard City Plant Installs Long Kilns

Kilns are now being installed at the Richard City, Tennessee, plant of the Pennsylvania-Dixie Cement Corporation.

The kilns measure 10 feet, and 11 feet 3 inches, in diameter by 343 feet 9 inches in length. The kilns are the product of the Woodlawn plant of Reeves Brothers, near Birmingham, Alabama. They required eight special L. & N. R. flat cars for shipment.

Install Dust Collectors at Lawrence Mill

Northern Blower Co., Cleveland, Ohio, announces that the installation of the dust-collecting equipment recently ordered by the Lawrence Portland Cement Co. has already been started. This equipment is to remove dust from the High Test Portland Cement Department of the Lawrence plant at Siegfried, Pa.

Phoenix Portland Cement Company Elects Officers

At the annual meeting of the Phoenix Portland Cement Company, the following directors were elected: J. W. Walker, Philadelphia; Lindley C. Morton, Birmingham, Alabama, C. L. McKenzie, Pittsburgh; Charles H. Cox, Philadelphia, and E. P. Haubert, Nazareth.

The directors organized by electing the following officers: President, Lindley C. Morton; vice-presidents, J. W. Walker and C. H. Cox, Philadelphia; R. J. Hawn, Birmingham, Ala.; secretary and treasurer, E. P. Haubert, Nazareth, and assistant treasurer, A. W. Nash.

Reports showed that the company has had a successful year. During the past year the output of the company has been increased from one million to two million barrels per year.

Vice-President of Petoskey Dies

Joseph Magnus, vice-president of the Petoskey Portland Cement Company, and an active citizen locally, died Wednesday, May 4th, at Lima, Ohio. At the time of his death he was enroute through Lima to his summer residence at Oden, Michigan.

Mr. Magnus was a member of the Rotary club, as well as the Elks and the Masons, and was the donor of the Magnus state park at Petoskey, Mich.

Indiana Portland Sends Bags for Flood Relief

In response to telegraphic requests, the Indiana Portland Cement Company recently shipped to New Orleans from its plant at Greencastle, 150,000 bags to be filled with sand for reinforcing Mississippi river levees.

Arrangements were made for special handling of the cars over the Monon and Illinois Central railroads.

Birmingham Plant Made Dustless

Dust has been completely eliminated from the Birmingham, Alabama, plant of the Phoenix Portland Cement Company. The Northern Blower Company, Cleveland, Ohio, to whom the equipment and installation contract was awarded, undertook to make the plant completely dustless, and according to reports, the guarantee has been entirely fulfilled.

To deal successfully with the large volumes of dust produced in the stone crushing department, close-fitting hoods and pipes conduct dust from all sources to two cloth, screen-type Norblo dust arresters. The fans are placed on the exhaust side of the arresters, permitting no dust to come into contact with the blades and minimizing the wear.

The finish mill department air is clean and fresh and it was found practical to install the driving motors and electrical control gear in the same room as the tube mills themselves.

The bag house is equipped with a 70-ft. Norblo cloth screen dust arrester of the same general construction as that used in the stone crushing department. This dust arrester extends over the entire roof of the building. The system is also used for ventilating the tops of the silos and the vent which comes from the Fuller-Kinyon compressed air pumps which discharge the cement into the silo bins.

President McCourtie Transfers Land to Company

Seventeen acres of land along Buffalo Bayou in Houston, Texas, have been transferred to the Trinity Portland Cement Company by W. H. McCourtie. The land was purchased last year by Mr. McCourtie from John Staub and associates as a site for the present $1,500,000 cement plant being erected on it.

North American Moves to Albany, New York

The North American Cement Corporation has begun the removal of its New York offices to Albany, New York. It is expected that part of the New York force will be brought at first and that gradually accommodations for a greater number from the metropolitan district will be made.

The Helderberg Cement Company, now a subsidiary of the North American, has been located at Albany for some time.

Penn-Dixie Superintendent Visits Bermuda

Superintendent Morris Fortuin of the Pennsylvania-Dixie Corporation, for his health's sake, spent a month's time in Bermuda, recently.

Great Lakes Plant to Have "Norblo" Recovery System

The Great Lakes Portland Cement Company has placed an order for a complete dust-collecting and recovery system for its plant at Buffalo, New York. The entire work is to be carried out by the Northern Blower Company, Cleveland, Ohio, and will include continuous suction air filters for the tube mill, and dust arresters for the crushing, bagging and cleaning departments.

Other recent installations made by the Northern Blower Company include one for the Pennsylvania Pulverizing Company, which will be the seventh for the firm, and another at the Birmingham (Alabama) plant of the Phoenix Portland Cement Company. With the aid of the Northern Blower Co., a system of continuous suction air filters was recently designed and installed by the superintendent of the Peerless Portland Cement Company, Detroit, Michigan, and has proven successful for the complete removal of all suspended matter in the finish grinding department.

International Uses Concrete Masonry in Own Construction

It is interesting to know that the International Cement Corporation has made it a point to use reinforced concrete and concrete building units in its own construction program. The Cuban Portland has used about 75,000 building units since 1924, Argentine Portland has used more than 100,000 since June, 1925, while Virginia Portland and the new plant of Louisiana Portland have utilized a great quantity of concrete units. At Sierras Bayas, which is 200 miles from Buenos Aires, where the Argentine plant is located, these units were used in erecting additions to the burner floor and finish mill buildings, as well as in dwellings and community houses for the employees. The new packhouse recently completed for the same subsidiary at Avellaneda, near Buenos Aires, also made use of concrete units. The use of concrete masonry was decided upon for the sake of maximum fire-safety, economy of construction, and a minimum of upkeep expense.

Lehigh Entertains Products Men

The Lehigh Portland Cement Company was host at a banquet to Columbus, Ohio, concrete block manufacturers on April 25th.

H. C. Shields, of the Service Department, spoke briefly on "Success in Manufacturing and Merchandising Concrete Products."

Florida Plant Entertains Visitors

Three out-of-town delegations were guests of the Florida Portland Cement Company and the Industrial Bureau of the Tampa Board of Trade, on April 22nd. Groups from Bradentown, Dade City and Zephyrhills, as well as Dr. G. L. Swiggett, economist, were escorted through the Florida plant and served luncheon in the mill commissary.

Penn - Dixie Temporary Bonds Being Exchanged

Permanent coupon bonds of the Pennsylvania-Dixie Cement Corporation first-mortgage S. F. 6 per cent gold bond issue, Series A, due September 15, 1941, are being exchanged for outstanding temporary bonds of this issue at the transfer department of the National City Bank of New York.

Electrical Engineers Visit Lehigh Plants

The annual regional convention of the American Institute of Electrical Engineers, Middle Eastern district, was held at Bethlehem, Pennsylvania, on April 21st to 23rd.

Four technical sessions were held, with ten papers on subjects of current interest. During the Friday evening session, Dr. Ernest J. Berg, professor of electrical engineering at Union College, spoke on his personal reminiscences of Dr. C. P. Steinmetz and Sir Oliver Heaviside.

Saturday was devoted to inspection trips through the Lehigh plant of the Bethlehem Steel Company, the Siegfried substation of the Pennsylvania Power and Light Company, and the Sandt's Eddy plant of the Lehigh Portland Cement Company.

State Geologist Summarizes Georgia Deposits

With portland cement mills in Georgia running day and night, including Sunday, the Empire state of the South is producing just about as much cement as it consumes, Dr. S. W. McCallie, state geologist, declared recently, following an inspection trip to one of the cement plants in South Georgia.

Although exact figures were not available in the state geologist's office, it has been estimated that Georgia uses approximately 1,500,000 barrels of cement annually. The estimated figures on the consumption of cement in the city of Atlanta alone are approximately 25,000 barrels a month.

At present there are but three cement plants in Georgia, one in Houston county at Clinchfield and two in Polk county near Rockmart, the state geologist said. The industry, he declared, is still in its infancy, but has remarkable possibilities for expansion.

The plant at Clinchfield, one of the South's largest plants, he said, was not put into operation until two years ago, and another unit was added a few weeks back, giving the plant an output at present of 3,000 barrels per day.

Louisiana Manager Talks at Bankers' Dinner

At a dinner of the New Orleans Chapter of the American Institute of Banking, held recently, the origin, manufacture and use of cement were told by L. R. Ferguson, manager of the Louisiana Portland Cement Company.

Order Dust Collectors for Nazareth Plant

Contracts have recently been placed by the Phoenix Portland Cement Co. for a complete dust-collecting system to be installed in the packing department of their plant at Nazareth, Pa. The entire contract for equipment and installation has been placed with Northern Blower Co., Cleveland, Ohio. It will follow closely along the lines of the larger dust-collecting system lately completed by the Northern Blower Co. at the Phoenix Portland Cement Co.'s mill at Birmingham, Ala.

Mill Planned to Use Alaskan Rock Deposits

Construction of a portland cement plant at Seattle, Wash., is planned as part of a development program to cost between $2,000,000 and $3,000,000 and to utilize valuable lime rock deposits on Dall island, Southeastern Alaska, according to announcement by officials of the Pacific Coast Company, whose headquarters are at Seattle. Details of the proposed development are not available as experiments have not been completed.

Sandusky Portland Cement Continues Radio Programs

The Sandusky Cement Company is continuing the sponsorship of the Cleveland Symphony Orchestra radio programs. Selections are taken from the best composers and vest-pocket size program booklets telling something of the radio musicians and the composers are distributed.

Mill Equipment

Hand Tachometer Is Light Weight

An accurate hand tachometer for speed recording is manufactured by the O. Zernickow Company, 15 Park Row, New York City. It is not a delicate instrument, and outside influences, such as electricity, magnetism, and changes of temperature do not affect the efficiency of the device. A double-cross pendulum permits its being used in any position, while carried in one hand.

Powerful Mine Locomotive Shown at Mining Congress

The 20-ton Baldwin-Westinghouse haulage locomotive, shown at American Mining Congress, is said to be the most powerful mine locomotive ever built, having two 150-horsepower motors. Being the first of its type, this locomotive incorporates the latest refinements of design dictated by results of past operating experience.

On an average 1 per cent grade against the loaded trip this locomotive will haul fifty loaded 2½-ton capacity cars at a speed of 9 miles an hour. The average trip will consist of 40 loaded cars hauled up an average grade of .9 of 1 per cent at an average speed of 10½ miles per hour and for a distance of 10,000 ft.

This locomotive will be delivered to the Bertha-Consumers Coal Company at Burgettstown, Pa., from the exhibit. Some of the features of the design of this locomotive are:—bar steel frame, electro-pneumatic control for series-parallel operation, air sanders, relay overload protection, leaf springs, through-bolts throughout, Timken roller bearings for journals, Timken roller armature bearing on motors.

Furnace Gun to Keep Lining in Good Condition

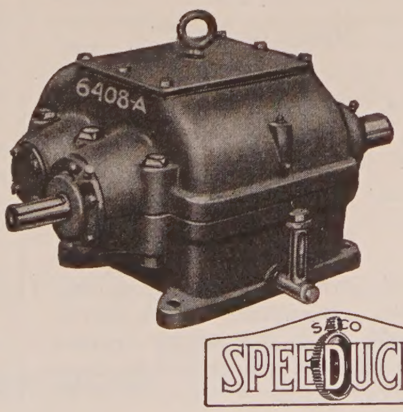
Botfield Refractories Company, Philadelphia, has developed a method of maintenance to keep refractory construction in good condition through periodic and systematic maintenance. Linings can be returned to good condition whenever the equipment is out of service for a short time. Sometimes, the repairs can be made without interrupting the operation of the equipment. Cracks, crevices, joints and brick pores can be filled up, quickly and efficiently. Burned-out sections and depressions can be patched. Walls can be maintained at their original thickness, with a smooth uniform surface presented to the attack of flame and other destructive elements encountered in operation.

In this method of refractory maintenance, three major elements are employed. They are the Adamant Gun, Adachrome (a chemically-neutral refractory material), and Adamant Fire Brick Cement. The Adamant Gun is used for blowing protective coatings on brickwork in the form of pre-mixtures of Adachrome, or other refractory materials, employing Adamant cement as a binder.

The operator simply connects the air line to the ½-inch standard pipe thread opening on the globe valve of the Adamant Gun, places the supply pipe in the pre-mixture, turns the globe valve, and the Adamant Gun sprays the pre-mixture, smoothly and evenly on the structure. Thus, all brick pores, open joints, cracks and crevices are quickly filled up, and the wall is given a protective coating that is highly refractory and resistant to the attack of fusible coal ash, sulphur and other impurities in either coal or oil fuel which cause fluxing, slagging or melting of the brick.

"Speeducer" Now on the Market

A new introduction made by the Stephens-Adamson Manufacturing Company, Aurora, Illinois, is the "Speeducer." It is a 1 to 300 hp. speed reducer, fitted with spur gears fully enclosed within an oil-tight housing. Ratios vary up to 2000 to 1 for the standard sizes. All gears operate in a bath of oil at all times.



New Shoe-Brake Designed by E. C. & M.

The Electric Controller & Manufacturing Company of Cleveland, Ohio, announce the E. C. & M. Type WB brake, a new development to meet the demand for a shoe-brake giving longer life of brake shoe linings and permitting quick removal of the motor armature with brake wheel in place without the necessity of taking the brake apart or disturbing any of its adjustments. It is an exceptionally fast operating brake.

The E. C. & M. WB Brake is different from other shoe-brake designs in that no levers or rods pass over the top of the brake wheel. The brake shoe arms are caused to operate in opposite directions by means of a simple lever movement having the connecting link within the base below the wheel.

Steel castings, machined to a high degree of accuracy, and oversize bearing pins assure smooth operation. Brake shoe linings are of asbestos interwoven with wire and moulded to shape under heavy pressure. Linings are ½-inch thick on the smallest size brake and ¾-inch thick on the largest size, thus permitting a large amount of wear before replacement is needed.

Improvements Made on Haiss Equipment

A number of changes have recently been made on its equipment by the George Haiss Manufacturing Co., Inc., New York City. Instead of malleable iron and steel, manganese chain and sprockets are used on creeper truck loaders. Belt conveyors have been improved by the installation of heavier belt of 32 oz. duck with one-eighth-inch rubber covering.

Zepp Hydrator Produced by Vulcan Iron Works

Completely automatic operation is one of the advantages of the Zepp automatic lime hydrator. The system of operation provides accurate and mechanical measuring of water and lime, and dumping into the pan, where hydrating takes place for ten or fifteen minutes. Parts likely to leak dust are enclosed in a dustproof casing.

The maximum power required, 7½ hp., may be supplied by a motor or a line shaft.

The Vulcan Iron Works, Wilkes-Barre, Pennsylvania, manufacture the Zepp hydrator.

With the Manufacturers

NOTES FROM THE FIELD

Gear Manufacturers

Extensive equipment has been installed by the *Stephens-Adamson Manufacturing Company*, Aurora, Illinois, for producing gears of all kinds on a quantity basis. Orders are being accepted for large contracts for quantities representing a season's or a year's supply.

Beaumont Purchases American

R. H. Beaumont Company have taken over the business of the *American Mfg. and Engineering Company of* Kalamazoo, Michigan. Products formerly manufactured by the company, including the American Slack Line Cableway Excavator, will now be manufactured by the R. H. Beaumont Company. Mr. S. O. Nafziger, President of the American Mfg. and Engineering Company will be associated with R. H. Beaumont Company.

New Films

Two films have been added by the *Hercules Powder Company*, Wilmington, Delaware, to its library of industrial education films. These films are entitled "The Explosives Engineer — Forerunner of Progress," and "Hercules Electric Blasting Caps," and are loaned without charge.

Combustion Engineering

The International Combustion Engineering Corporation, New York City, has removed its offices and laboratories to its new building on Madison Avenue, between 35th and 36th Streets. This is reported to be the sixth largest office building in the country and a part of the space will be used by the company in completing the design and engineering detail of its first large orders for apparatus for the distillation of coal at low temperatures.

A half floor has also been turned over to a department under the direction of Dr. Wm. L. De Baufre for perfecting a new phase of power plant combining the use of pulverized coal and low temperature distillation.

The Cleveland district offices of the *Combustion Engineering Corporation*, the *Ladd Water Tube Boiler Company*, and the *Heine Boiler Company*, have been consolidated and will be located at 1107 Guardian Building. *Frank Henderson* is Cleveland district manager of these three associated companies.

Three Score and Ten

The T. B. Wood's Sons Company, Chambersburg, Pa., manufacturer of power transmission machinery, is celebrating the seventieth anniversary of its establishment.

The organization of the firm dates back to pre-civil war days, when T. B. Wood, then master mechanic of the Franklin Railroad, now the Cumberland Valley Division of the Pennsylvania Railroad, gave up railroading and established a business for the manufacture of appliances for transmitting power.

Upon the retirement of Mr. Wood in 1889, his sons, George A. Wood and Theodore M. Wood conducted the business under the name of T. B. Wood's Sons, until January 1, 1906, with no changes in name of personnel except that Charles O. Wood, son of George A. Wood was taken into the firm in 1899.

Repaired Belting Service

The Cleveland Oak Belting Company, Cleveland, Ohio, has established the "Nu-ply" worn out belting reconditioning service. This service provides a thorough cleansing operation, followed by the addition of an outer ply of first quality oak tanned leather.

Gypsum Offices

New offices of the *United States Gypsum Company* at 300 West Adams Street, Chicago, were opened on April 11th. The removal was from 205 West Monroe Street, where the offices of the company had been located for twenty-four years.

New Prices

The Webster Manufacturing Company has published a revised price list now effective, on its screw conveyors. This supersedes lists on Pages 274, 275, 299, of the No. 48 catalog.

Industrial Literature

Jeffery Equipment

"Jeffery Equipment for Handling Stone, Gravel, Sand, Cement, Gypsum, Lime, Slag, Etc.," is the title of the *Jeffery Manufacturing Company's* Catalog No. 437, a very recent and complete publication.

Chemical Course

The program in chemical engineering and graduate courses in general chemical, metallurgical, and gas engineering has been published by the University of Michigan, Ann Arbor, Michigan, and may be secured upon request made to the Department of Chemical Engineering.

"Lime in 1925"

A. T. Coons is the author of the Department of Commerce publication, *"Lime in 1925."* General conditions, production, and imports and exports are covered.

Fire Brick Uses

The Ashland Fire Brick Company, Ashland, Ky., is distributing a small, interesting folder giving four specific fire-brick uses in plants and the type of brick recommended for each.

Timken Report

The annual report of *The Timken Roller Bearing Company* for the year ending December 31, 1926, shows net profits from sales, with other net income, of $8,474,103.00, after ample reserve for the depreciation and after reserve for United States Income Taxes. Cash dividends were paid during the year to the amount of $5,403,969.00. A balance of $3,045,120.00 was transferred to surplus account.

Refractory Brick Folder

An elaborate folder published by the *General Refractories Company* of Philadelphia, Pennsylvania, details very completely the service of *Arcofrax* high alumina brick in the four kilns of a prominent cement plant. The exact length of service of each kiln, the number of shutdowns and the duration of the latter are shown.

"Cement in 1925"

"Cement in 1925" is now available from the Superintendent of Documents, Government Printing Office, Washington, D. C., at a small charge.

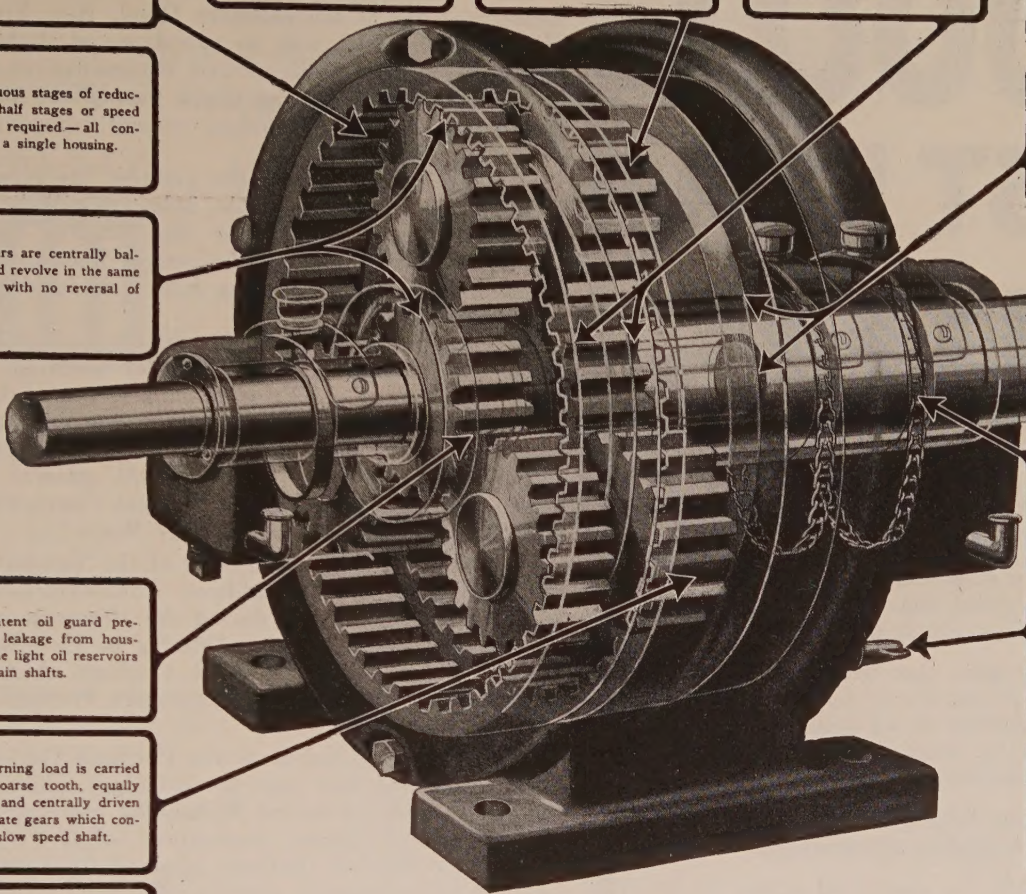
The Planetary Principle provides more teeth in constant mesh, and allows for greater reduction in each gear set.

Reducers may be suspended from the ceiling by merely removing cap screws and changing position of end plates and oil filling plug.

Fewer gears are used in any reduction of given rating—all gears are standard pitch and bushed with phosphor bronze.

Regardless of horse power or ratio, wide face, coarse tooth, standard pitch gears are used. More teeth in constant contact guarantee greater emergency strength.

All reducers listed in our catalog are for heavy, continuous duty, and are guaranteed to withstand 100% mommentary overload.



Continuous stages of reduction, no half stages or speed increases required—all contained in a single housing.

All gears are centrally balanced, and revolve in the same direction with no reversal of power.

The patent oil guard prevents oil leakage from housings to the light oil reservoirs on the main shafts.

The turning load is carried on the coarse tooth, equally balanced and centrally driven intermediate gears which connect the slow speed shaft.

The intermediate gears are properly balanced by the opposing forces of the driving pinion and stationary internal gear, eliminating undue bearing strain and bearing troubles common in other types of reductions.

Extra large, phosphor bronze bushings are used throughout to insure a minimum of wear on turning parts.

Separate oil reservoirs on main shaft bearings permit the use of lighter oil—heavy gear oil is kept from main shaft bearings.

The oil overflow petcock prevents undue heating and excessive wear due to over oiling.

James Reducers use Gears having from 3:1 up to 7:1 Factor of Safety, based on the Lewis Formulae and ordinary steel running 20,000 lbs. tensile strength per square inch.

All gears are made of S. A. E. 3140 chrome nickel steel, heat treated, with a tensile strength of approximately 175,000 lbs.

Compare a James Speed Reducer

part for part with ordinary reducers of similar horsepower and rating!

The spur gear speed reducer was originated, designed—improved, simplified—and standardized by the D. O. James Manufacturing Company, established in 1888. We have specialized in the making of cut gears and speed reducers for more than twenty-five years. Since that time when we were the only speed reducer manufacturer, we have constantly improved, designed and developed new types, until today we are producing from 600 to 700 standardized reducers every month.

There are over 35,000 James Reducers used by industry today on drives of every nature—many of them having given 10, 15, even 20 years of uninterrupted service without repair or maintenance.

The major reasons for the supremacy of James Reducers on drives of every kind are most graphically shown in the illustration above. These features, exclusively James, are the result of long years and tireless effort on the part of our engineering organization, and the proof of their superiority is complete acceptance as standard throughout the engineering fraternity.

Note the size and material in the bushings on James Reducers. Compare them with ordinary reducers. Compare the shaft sizes for a unit of any given horse power and ratio with other makes of speed reduction. Compare the principle—planetary—with any other principle—the size of gears, the width of gear faces, the gear material, the compactness of the unit—in fact, we invite comparison of any part or principle of the James Planetary Speed Reducer with any other reduction of similar horse power and rating.

Let us give you complete information on the sizes of gears in each stage of reduction, or any other information you may desire, so that you may check them for design, durability and the factor of safety that is inbuilt.

The term "efficiency," as applied to speed reducers, means not only applied and delivered power, but low first cost and the guarantee of trouble-free operation—it is found in every James Reducer.

James Reducers are made in types to suit every requirement—herringbone, planetary spur gear and worm gear—to drive up, down, at an angle or in a straight line—for light, medium or heavy duty, and in all ratios and up to 1,000 H.P.

As the largest manufacturers of speed reducing transmissions, we invite your inspection of our facilities, and ask the opportunity of helping you to select the proper type of speed reducer for your work. Our engineering service is gratis.

D. O. JAMES MANUFACTURING CO., 1120 West Monroe Street, Chicago

D.O.JAMES

Wood's
CAST IRON PULLEYS

Just Note Their Design

THERE'S a great deal of ingenuity and thought behind the design of Wood's Cast Iron Pulleys, simple as they may seem.

Witness their split cast iron construction which makes it possible to fit Wood's Universal Giant Pulleys on all standard shafts, large or small, by simply changing the split bushings to conform with the shaft diameter.

Cast iron gives Wood's Universal Giant Pulleys perfect rigidity and strength.

Four bolts hold the shaft and pulley in a rigid vise-like grip while the rims are double bolted to give a hairline fit at the rim joint.

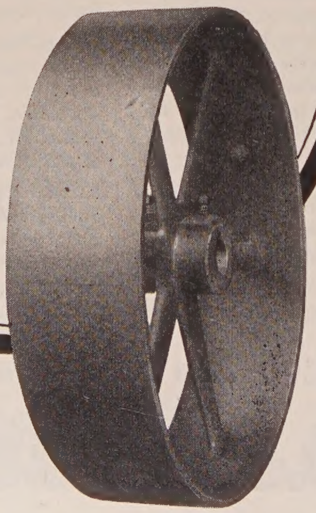
Then there's the fine workmanship characteristic of all Wood's Power Transmission Equipment—a traditional Standard since 1857.

When ordering mill supplies insist on genuine Wood's Cast Iron Pulleys—they're better.

T. B. WOOD'S SONS COMPANY
Chambersburg, Penna.

Write for Descriptive Catalog

SEVENTY YEARS of SERVICE 1857 1927 T.B. WOOD'S SONS CO. POWER TRANSMISSION MACHINERY CHAMBERSBURG, PA.



Portland Cement Association Holds Spring Meeting

The Portland Cement Association held its regular spring meeting at the Biltmore Hotel, New York City, May 16, 17, and 18, with an attendance of slightly more than 300 executives, officers and representatives of portland cement manufacturing plants throughout the United States and Canada. Sixty-four cement companies were represented at the meeting.

What is claimed to be the greatest concerted safety drive ever made by a whole industry will be opened June 1, it was announced by the Accident Prevention Committee. Every man in the cement industry is being urged to co-operate in making June a no-accident month for every cement plant.

Technical problems and mill practice received attention at the general session opened Tuesday morning. An address by Dr. A. F. McBride, Commissioner of Labor of the state of New Jersey, was heard on the subject, "What New Jersey Does for Its Physical Handicaps Through Its Rehabilitation Division." A. G. Croll, general superintendent of the Atlas Portland Cement Company, spoke on "Cleaning Kiln Stack Gases by Water."

Dr. George K. Burgess, director of the National Bureau of Standards, gave an address, "Standardization and Standard Specifications," during the afternoon continuation of the general session. "Mixing of Flue Dust with Slurry," was discussed by R. R. Coghlan, chief chemist of the Osborn plant of the Southwestern Portland Cement Company.

G. S. Brown, president of the Portland Cement Association, presided and gave the principal address at the business session conducted Wednesday morning. Award of the Portland Cement Association Safety Trophy was made to the Mitchell, Indiana, plant of the Lehigh Portland Cement Company and the Winnipeg plant of the Canada Portland Cement Company, winners of the 1926 safety contest. The two plants both ran throughout 1926 and for several months of 1927 without a single lost-time accident.

A formal banquet in the grand ballroom of the Biltmore closed the series of meetings Wednesday evening. Frank H. Smith, president of the Lawrence Portland Cement Company, was toastmaster, and Thomas H. MacDonald, director of the U. S. Bureau of Roads, was the principal speaker. "Two Thousand Years of Road Building," was the subject of an interesting illustrated lecture by the road chief.

No Franco-Belgian Cement Pact

It has been persistently rumored abroad that an agreement between Belgian and French portland cement manufacturers is proposed. It is now stated on reliable authority, however, that no such agreement is contemplated. The rumor arises from the efforts made for some time by the Belgian government to persuade the manufacturers to conclude a national agreement with a view to assisting the export of Belgian portland cement. If such an agreement were reached measures would be taken, with government co-operation, to assist the sale of the Belgian product on the world market.

Until the agreement has been concluded the Belgian government is withholding its assistance. It is thought possible that if a national agreement were reached an attempt would be made to carry it into certain international spheres, but the actual aim is rather towards Scandinavia than towards France.